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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,301	06/13/2003	Seiji Sarayama	2271/62289-Z	5867
7590	05/20/2005		EXAMINER	
RICHARD F. JAWORSKI Cooper & Dunham LLP 1185 Avenue of the Americas New York, NY 10036			HO, TU TU V	
			ART UNIT	PAPER NUMBER
			2818	

DATE MAILED: 05/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	10/601,301	SARAYAMA ET AL.
	Examiner	Art Unit
	Tu-Tu Ho	2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.  
 If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.  
 If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.  
 Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1) Responsive to communication(s) filed on 29 April 2005.  
 2a) This action is FINAL.                            2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4) Claim(s) 39-44 and 78-86 is/are pending in the application.  
     4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 39-44 and 78-86 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on 14 October 2003 is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) All    b) Some \* c) None of:  
         1. Certified copies of the priority documents have been received.  
         2. Certified copies of the priority documents have been received in Application No. 09/590,063.  
         3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
     \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____	4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) 6) <input type="checkbox"/> Other: _____
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**DETAILED ACTION**

1. Applicant's arguments with respect to amended claims 39-44 and new claims 78-86, filed 04/29/2005, have been considered but they are moot in view of new ground(s) of rejection.

*Specification*

2. The amendment filed 04/29/2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: "a defect density of less than about  $10^2$  cm<sup>-2</sup> and less than about  $10^3$  cm<sup>-2</sup>". Applicant appears to indicate that the change was for a typographical error. However, it is unlikely that the same typographical error happened to all of the occurrences.

Applicant is required to cancel the new matter in the reply to this Office Action.

*Claim Rejections - 35 USC § 112*

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 39-44 and 78-86 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the (original) specification in such a way as to reasonably convey to one

skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Specifically, the claims and the specification as originally filed specify a defect density of less than about  $10^2$  cm<sup>-3</sup> and less than about  $10^3$  cm<sup>-3</sup>. Nevertheless, the present amended claims and amended specification specify a defect density of less than about  $10^2$  cm<sup>-2</sup> and less than about  $10^3$  cm<sup>-2</sup>, which are clearly not in the original specification. Applicant appears to indicate that the change was for a typographical error. However, it is unlikely that the same typographical error happened to all of the occurrences.

#### *Claim Rejections - 35 USC § 102*

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. **Claims 39-42, 78, and 80-82** are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Cho et al. U.S. Patent 6,372,041.

Cho discloses a bulk crystal substrate of GaN, comprising:

a slab of a GaN single crystal (column 2, lines 54-65 and column 6, lines 35-67, and note that Cho uses the terms GaN “bulk single crystal”, GaN “single bulk crystal”, and simply GaN interchangeably) having a substantially uniform composition of GaN in a thickness direction of said slab, and having a thickness between 100 to 350  $\mu\text{m}$  (column 6, lines 35-42).

Thus, Cho’s thickness of between 100 to 350  $\mu\text{m}$  anticipates the claimed thickness of exceeding 10  $\mu\text{m}$  of **claims 80 and 78**, of exceeding about 100  $\mu\text{m}$  of **claims 40 and 81**, and of exceeding about 300  $\mu\text{m}$  of **claim 41**.

However, the reference fails to disclose exactly that the slab has a defect density lower than about  $10^3 \text{ cm}^{-2}$  or lower than about “ $10^2 \text{ cm}^{-2}$  as claimed.

Nevertheless, Cho discloses that the slab has a defect density lower than about  $10^5 \text{ cm}^{-2}$  (“dislocation density”…“less than  $10^5$  per square centimeter”, column 6, lines 50-55). Therefore, if one of ordinary skill in the art interprets that “lower than  $10^5 \text{ cm}^{-2}$ ” includes or “describes” “lower than  $10^2 \text{ cm}^{-2}$ ” and “lower than  $10^3 \text{ cm}^{-2}$ ”, then the Cho’s reference anticipates the claims.

In the alternative, although Cho does not disclose the exact claimed value, Cho discloses in column 1, lines 40-45, that the GaN bulk slab shall be substantially free of defects for electrical and optical applications, thereby teaching the artisans to reduce the number of defects as much as possible. In other words, it would have been obvious to one of ordinary skill in the art the time the invention was made to modify the Cho reference’s value of “lower than  $10^5 \text{ cm}^{-2}$ ” such that the value became “lower than  $10^2 \text{ cm}^{-2}$ ” or “lower than  $10^3 \text{ cm}^{-2}$ ” as claimed. One would have been motivated to make such a change because Cho teaches that the GaN bulk slab shall be substantially free of defects for electrical and optical applications. In addition, it has been generally accepted among artisans that searching for an optimum value, as in this case the smallest number of defects, is within the routine skill, therefore would have been obvious to one of ordinary skill in the art at the time the invention was made, of one of ordinary skill in the art.

Referring to **claim 79**, a cathode luminescent spectrum of said slab of GaN single crystal structure unlikely has two identical peaks; or in other words, a cathode luminescent spectrum of said slab of GaN single crystal structure likely has no more than one peak.

Referring to **claims 84-86**, Cho further discloses that said bulk crystal slab substrate can be used in a laser diode or a light emitting device (column 3, last paragraph), either of which device as is known by an artisan is a optical semiconductor device, and since an optical semiconductor device in operation involves the movement of electrons, it is also properly termed an electron device.

***Claim Rejections - 35 USC § 103***

5. **Claims 43 and 44** are rejected under 35 U.S.C. §103(a) as being unpatentable in view of knowledge in the art as disclosed by Kizuki U.S. Patent 5,71,4006.

Cho teaches a slab of bulk crystal substrate of GaN as claimed but fails to disclose a specific crystal system as claimed. Specifically, Cho teaches that said slab is formed of GaN of an inherent unspecified crystal system; thus fails to disclose that said slab is formed of GaN of a hexagonal crystal system or a cubic crystal system. Cho in addition, as detailed above, discloses that the slab substrate can be used as a substrate in an optical semiconductor device, such as a laser diode or a light emitting device.

Kizuki, is also disclosing an optical semiconductor device, teaches that a hexagonal crystal system or a cubic crystal system is a crystal system one would use for single crystal GaN (column 1, lines 10-30).

Therefore, it would have been obvious to one of ordinary skill in the art the time the invention was made to form the Cho reference's slab of bulk crystal substrate of GaN such that said slab is formed of GaN of a hexagonal crystal system or a cubic crystal system. One would

have formed such a crystal structure because a hexagonal crystal system or a cubic crystal system is a crystal system one would use for single crystal GaN, as taught by Kizuki.

*Conclusion*

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office Action. See MPEP § 706.07(a).

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tu-Tu Ho whose telephone number is (571) 272-1778. The examiner can normally be reached on 6:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, DAVID NELMS can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TH

Tu-Tu Ho  
May 18, 2005

  
David Nelms  
Supervisory Patent Examiner  
Technology Center 2800